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The Educational Valorisation of Traditional Knowledge: an Intervention-Research with *Tuleros*, Mayan Artisans of Atitlán Lake in Guatemala

Glenda Galeotti
(Università degli Studi di Firenze, Italia)

Abstract The article presents an Action-Research with the Tuleros Association of Santiago Atitlán, Guatemala, focusing on the analysis of skills that these Mayan artisans employ in the production process of *tul*, to create typical objects of Mayan and *tzutuj'il* culture. The aim is to test how educational valorisation of their traditional knowledge promotes the safeguarding of local biocultural diversity and the sustainable management of natural lacustrine resources. The ecosystemic analysis of the *tul* production integrates individual and collective perspectives on skills, but also detects how productive skills broaden within the context of reference, thus transforming it.

Keywords Biocultural paradigm. Ecosystems research. Adult education.

1 Introduction

The naturalistic view of human development considers the "production process" as a key activity for livelihood (Cirese 1984). It is made up of a series of procedures aimed towards accomplishing a goal – survival – that generate products, create social relations, and share ideas, knowledge and values. The object of these activities are the natural resources, that thanks to human action become social products that are historically activated and defined in their ecology by practices of control and by knowledge developed in the relationship between humans and nature over time.

At the same time, the environment is not a neutral reality in which humanity can intervene, project its ideas or its representations. It intertwines with the lives of the individuals entrenched in the experience of "specific bodies in a specific context" (Ingold 2004; Ingold, Palsson 2013). The latter includes both biophysical components and social, technical and cultural

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elements (Cavalli Sforza 2010; Descola 2010). Overcoming the dualism of culture/nature, the biocultural perspective allows us to interpret the relationship between natural resources, traditional production practices and specific organisational forms.

Besides the qualitative and quantitative availability of natural resources, social structures of a given society influence the production. These arise from the interaction of the productive forces with the organisational forms and with the distribution systems of material goods; they depend on the social relationships, norms and ideologies but also on the technologies available (Godelier 1975; Leroi-Gourhan 1977; Warnier 1999; Angioni 2004, 2011). Therefore, production is always a form of adaptation to the natural and social conditions that are also the results of production modalities. This dual causality allows progress of productive forces and transforms society and its members. It activates an organic sphere between man and nature and leads to a specific experience of living the world in active, operational and collective forms common to all processes of human production.

A pedagogical perspective allows reflecting on the acquired knowledge that is used in the production and highlighting how that is closely linked to the human training process (Bruner 1973; 1986; 1990; 1996). In fact, the realization of a product implies in-depth knowledge on the life habitat and know-how to adapt and transform it through the material and immaterial appropriation of its resources (Ellen 1996). This mutual exchange between nature and humans modifies the environment and humans themselves, creating and sharing new and increasingly complex knowledge. It is the result of relations among individual and collective aspects, with rational, emotional and sense-motor dimensions involved in the human training process and, at the same time, medium and outcome of knowledge, uses and adapted to the living environment.

Therefore, the creative and productive work is possible thanks to the human mind in action. It is an embodied mind[1] that guides the action, producing meanings useful to settle in an area over a historical time, leaving tangible and intangible products of civilizations that make possible to live in human aggregates. These aspects are object of the studies developed by the so called pedagogy of labour, "a pedagogy that, alongside to the mind and emotions, focuses also on the arms" (Federighi 2010). This field of study and pedagogical practices interprets 'work' as a training environment for human development, and adopts the perspective of the theory of action (Leont'ev 1978; Engeström 2005). Here human action is described

1 Cognition (or mind) is embodied when it is deeply dependent upon features of the physical body of an agent, that is, when aspects of the agent's body beyond the brain play a significant causal or physically constitutive role in cognitive processing (Wilson, Foglia 2011; Varela, Thompson, Rosch 1993).

and interpreted by referring to the *motivated activity directed at an object* and to the contextual factors that determine it.

Set in this framework, the article shows an intervention-research with Mayan traditional artisans, focusing on the analysis of skills that these people employ in the production process of *tul*, a plant that grows alongside the Atitlán Lake, used to create typical objects of Mayan culture. The aim is to test how educational valorisation of their know-how promotes the safeguarding of local biocultural diversity and the sustainable management of natural lacustrine resources.

Considering knowledge as a complex object, result of the relations between the biological and cultural components involved in the training process and those between human beings and life habitats, the study has adopted an eco-systemic approach (Bronfenbrenner 1979; von Bertalanffy 1968; Minati 2010) to detect how artisan's know-how broaden within the context of reference, transforming it in a sustainable way. On the other hand, the educational valorisation of this know-how transmits this sustainable knowledge to the whole community, transforming them into a shared heritage.

2 Handcraft Production and Skills: the Eco-systemic Relationship between Dexterity and Intellectuality, Practices and Context

In spite of the variety of forms that are determined historically and culturally, production has always been a constant factor of human existence. It is expressed in units of dexterity and intellectuality. Manual skills develop through repetition of predetermined movements over time, whereas technical intelligence develops through the imagination, which then leads and guides manual ability. These two dimensions are not separable and they manifest in means and modes of production, as a set of operational concepts translated into action. The interchange between these two components is achieved mainly in the path from searching for solutions to the detection of problems.

Being an activity aimed at a goal, the skills and knowledge gained in the production are also expressed in the product design and in the planning of process, where physical and intellectual faculties are employed together.

Design skill provides the ability to anticipate, not only the immediate and overall results of the action, but also the prevision of their instrumental use, as well as of the means and tools useful in the production process or to produce other means and tools for the same scope (Cirese 1984).

Dexterity and intellectuality depend both on explicit and tacit knowledge

(Polany 1966) of the production process. The explicit dimension can be articulated and explained; it accompanies or is based on a tacit dimension previously internalized and incorporated that concerns sets of skills and abilities hardly formalized but rather transmitted by example and practice (Sennett 2008).

Automatisms put in place in certain circumstances allows selecting and implementing, often unconsciously, an effective action – direct to a purpose that is part of this second type of knowledge. Tacit knowledge does not only concern motor skills, but also includes the sense of objects, the world, the people with whom we interact, the emotions experienced in the body or dependent on the social relationships (Angioni 2011).

They are based on the vision of reality as an experiential corpus, in accordance with the definition proposed by Michael Polany and taken recently by Richard Sennett (2008). Experiential knowledge based not only on the operating rules and procedures, but also on the ability to adopt strategies based on complex cognitions that are the result of critical reflection, insight, deep understanding of the contexts.

For Sennett, the transformation of information and practices into tacit knowledge is a fundamental process for all technical skills. Learning a skill, we develop a repertoire of complex procedures to reach a continuous interaction between tacit knowledge and self-conscious awareness: the first one works as an anchor, the second one express a critical and corrective function. Tacit knowledge is connected to the material culture through the coupling between the sensory-motor behaviours and the objects, which embedded contribute to the subjectivities results in the acquisition of self-awareness (Gibbs 2005).

Therefore, know-how is not just about technical skills, but also contained into highly subjective perceptions, represented by subtle sensations, practice repeated in time and space, coordination among parts of the body and mind with the working tools and objects or materials.

On the other side, this knowledge is also the result of a specific production organization, in which each step has its own sense if connected with others and contributes to the shared heritage of working habits that combine ideas with things, thoughts with actions, meanings with practices.

Routine and systematic knowledge (embedded knowledge), barely formalized, are the result of experiential learning that manifests itself in the complex conduct of the body (embodied knowledge), immediately understood by those who share same frames of sense (enculturated knowledge). Here the emotional and rational, the individual and collective dimensions of knowledge are integrated in production processes and in the unity of intellectuality-dexterity of the craftsman.

Production knowledge also has a social and relational significance, linked to specific forms of language and communication, to values and identity shared by a specific community (Sennett 2012). Sennett also uses

the concept of embodied experiences to illustrate how physical work can instil in people a dialogic social behaviour.

To create an object in a context of collaboration implies the informality of interactions with others in bodily sensations, by means of the relationship based on credibility, trust and cooperation. Body gestures implements this relationship, because they are learned behaviours that create an emotional bond: in becoming experts in gestures, informality acquires a somatic and expressive quality.

Therefore, skills may relate to the fabrication of a specific product, but also to the organisational dimension of work. They can be expressed by a single individual or by a community of individuals engaged in the same production process. In this second case, the relational dimension determines the spread and distribution of knowledge among several individuals and even in the artefacts and tools used by the community for their production, in terms of social and cultural practices. In this way, skills emerge from social interactions within a given cultural space, so the context with its practices and mode of action not only contributes to create know-how, but is also competent and constantly developing through these processes.

To summarize, the knowledge used in a specific production derives from internal (mental and bodily) and external (social, cultural and environmental) processes for an individual subject, who operates in a context with specific resources (be them technical, instrumental, natural) to reach an objective and to realize a product. This knowledge is the result of complex learning resulting from the smart connections among a plurality of processes (individual, collective, rational, emotional and sense-motor) that unfold in the human training.

3 An Intervention-Research with *Tuleros* of Atitlán Lake

The action-research with the Tuleros Association of Santiago Atitlán aimed to test how educational valorisation of their productive know-how promotes the safeguarding of local biocultural diversity and the sustainable management of natural lacustrine resources.

It was an empirical study to identify strategies and actions for the protection of natural resources through the educational enhancement of Mayan traditional production, know-how and environmental knowledge.[2]

The methodology used in the study is PAR (Orefice 2006; 2013). It involves the multiple levels and fields that make up the knowledge system of

2 The research has been realized in the international cooperation project "Urban environmental sanitation in Santiago Atitlán", that aimed to improve environmental management with the implementation of a Municipal solid waste treatment system. The project has been financed by Emergency Program of the Italian Ministry of Foreign Affairs in Guatemala and

individuals and groups; it combines the cognitive exploration of feeling and thinking; it detects existing relationships between the different elements that contribute to human training, also connecting it with CH generated.

This methodology was applied at both investigation level and intervention levels, that will be separately illustrated for sake of clarity, but that are integrated with each other. From the research point of view, the activity has consisted in participatory analysis of the *tuleros*' *production process*, in order to detect skills and knowledge used in it and to identify how they contribute to take care of and manage local natural resources.[3]

The intervention of adult non-formal education took the form of a training course that also involved other local key players such as traditional producers, politicians and representatives of civil society. It focused on the analysis of local practices of use and management of natural resources, in developing critical-reflective attitudes useful to re-read the experiences, production problems and hence promote changes in the local life system with new interpretive lenses.

Since this was a participatory research, *tuleros* were involved in all its phases, making the study "a democratic and participatory process aimed at developing practical knowledge" (Reason, Bradbury 2001). Connecting action and reflection, theory and practice, participation is aimed at finding practical solutions to people's problems and, more generally, to the development of individuals and their communities.

Following these methodological criteria, phases of action-research are showed in the table below, together with the objectives, activities and outputs produced for each of them.

Table 1. Phases of action-research

Research Phases	Objectives	Activities	Output
Contest Analysis	To generate knowledge of the local context and related problems of natural resources management	Collecting and analysing data from secondary sources and other documents	Report on first analysis of the Municipal management system of natural resources

it was implemented by the Italian NGO Africa 70, in collaboration with Legambiente, ADEC-CAP, Municipality of Santiago Atitlán and the Italian company Ambiente Energia Brianza.

3 At this stage of research, I have developed sheets on the production process of *tul,* from data collected in the focus group and interviews with *tuleros* and publications on the subject .

Research Phases	Objectives	Activities	Output
Participatory analysis of the *tuleros* production process	To identify problems of traditional producers related to natural resource management	Participative observation Semi-structured interviews at individuals and group	Report on the knowledge and skills used in the production with *tul*
Definition of hypothesis for problem solution	To formulate an hypothesis for the sustainable management of natural resources starting from the knowledge and skills involved in the production	Adult Education activities	A proposal of Municipal Regulation of environmental management of Atitlán Lake's banks
Verification of hypothesis	To assess possibilities of implementation of Regulation	Focus group with members of Consejo Municipal de Desarrollo	Road-map for assumption of regulation in Municipal Law
Evaluation of process	To evaluate formative outcomes of participants To evaluate research activities	Evaluation of activities with participants to training Meetings with key players for research results dissemination	Agreements among local and strategic players for the sustainable management of natural resources

The *tuleros* are Mayan artisans of Lake Atitlán and use a plant[4] that grows along the banks of the lake to create a wide range of domestic and ritual objects, such as *petate*, a mat present in every indigenous area home.

Strongly linked to tradition and cultural identity of this population, the *tul* processing has maintained the same characteristics over centuries. Although vegetable archaeological finding are not available because of difficult conservation in tropical area, depictions of *tul* objects or rulers sitting on mats are frequently present on the Mayan polychrome pottery

4 Scientific name *Scirpus Californicus*, belonging to the family of *Cyperaceae, tul* is a perennial that can reach a height of three meters. It has a geographical distribution that goes from the United States to Argentina; Guatemala is located between 0 and 1,700 m above sea level on the banks of the lakes. For someone, the word *tul* is a corruption of *tule*, a Nahuatl term that in Mexico means 'rush', but that does not appear in the vocabulary of Mexican language compiled in 1571 by Alfonso de Molina, where instead appears the word *tollin* with the same meaning. In *tz'utujil* and *kaqchikel*, the two Mayan dialects spoken around of Lake Atitlán, *tul* is called *ch'upup,* which means 'to cut'. Finally, in the *kaqchikel* dictionary of Thomas de Coto, compiled in the sixteenth century, in addition to the word '*ch'up*' related with the action of the cut, the rush was called "*ru pop choy*" which can translate into "petate (mat) of the lagoon". (Monteroso, Azurdia Bravo 2008; Casa de Estudios de los Pueblo del Lago Atitlán 1999).

and codes. These artefacts were also part of the ceremonial complex or were in daily use of the *élite*.

In colonial chronicles it is reported that the main use of *tul* was to produce the *petate*, a woven mat used to cover the floors and walls of the house, to realise the seats of the nobility, which confer prestige and authority to them in religious ceremonies and in political meetings.[5] In the Mayan classic period, the title of *Ajpop*, "Lord of Mat" was used to refer to the rulers; the first month of the Maya calendar, *Pop*, has depicted in its glyph a *petate*.[6]

Even today *petate* maintains its sacredness for 'Cofradias', which use it to cover the statues of the saints in the various religious events, as is the case for the "Cofradias de Maximon"[7] of Santiago Atitlán.

To date, the techniques of this craft production have remained unchanged over the centuries, and in particular, those for the realization of the *petate tul* which is the most common for domestic use.

The *tul* has very important environmental functions: it filters nitrates and excess organic matter by improving the quality of water; it protects the lake banks from excessive erosion, it is home to ducks, migratory and other birds and breeding ground of native species of fish, crabs and shells.

Despite the great importance of this plant for the maintenance of biodiversity and CH of Lake Atitlán, its significant contribution to the community life remains unknown to many Guatemalans. As with other native species, even the *tul* is at risk of extinction because of its intensive exploitation. *Tul* crops are threatened by human activities around the lake, by demographic pressure on the ecosystem and progressive loss of ecological TK.

In Santiago Atitlán, *tuleros* are organized in an association that is more than 40 years old.[8] This is the place for sharing knowledge and values related to the *tul* production, to incentivate intergenerational transmission. It also represents an arena of political and social participation for the affirmation of the rights of these traditional workers and for the protection of the raw material, source of their income.

Despite being broadly representative of the local Mayan culture, the lack of recognition by local and national institutions limits the production capacity of *tuleros* and feeds social unrest.

5 In the *Chilam Balam*, Mayan opera of Yucatan, throne and *petate* terms are interchangeable.

6 The word *pop* also means 'to unite' and it refers to both the technique of Mat creation and the role of the ruler to the people.

7 Maximon is a popular saint venerated in various forms by the Maya of the western Guatemala highlands, but the Roman Catholic Church does not approve it. Maximon could be the creolization of a pre-Columbian Mayan god with influences from Spanish Catholicism (Morales 2008).

8 Recognized by the government since 1968.

The same Tuleros Association serves as a tool for the enhancement of the Mayan culture and its intergenerational transmission; therefore, it can be considered an *Heritage Community*, as the Faro Convention defines it. In fact, the Association gathers people with common values, beliefs, knowledge inherited from the past in which they identify and they wish to support them in the framework of public action and to transmit them on to future generations.

4 Educational Valorisation of Productive Know-how of *Tuleros* for Sustainable Management of Lacustrine Biodiversity

Participatory analysis of the production process of *tuleros* considered the following aspects: the main characteristics of production process, the flow of production, skills and knowledge used in production process (Galeotti 2015).

In order to identify main features of this craft production, descriptors have been borrowed from the definition of Cirese of the production process, as a vital human activity for survival (1984). The anthropologist declines it in elements and conditions that contribute to its realization: purpose, means, activities, object, control and the product. To these he adds energy used in creating the product and information, as a set of knowledge used at all levels of the process, pre-existing the individual, who elaborates it interacting with other members of the group. The analysis continued with the reconstruction of the various stages of the production flow in order to identify the key activities related to processing *tul*, as shown in fig. 1.

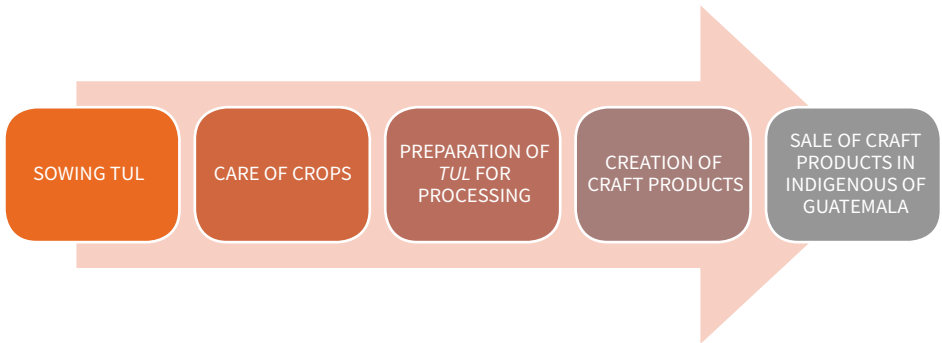

Figure 1. The production flow of *tuleros*

The description of each key activities is divided into phases of the organisational arrangements with technologies and tools used, resulting in outputs.

The skills used in production process have been identified through the operationalization of the concept of competence proposed by Guy Le Boterf as "combinatorial knowledge" always tied to a concrete act, which brings together resources of different kinds – internal and external to an individual or a group – to produce an expected performance (Le Boterf 1995; 1997; 2000).

For key activities outlined above, we have identified the skills employed (to be able to... action verb and object) articulating these in related knowledge and abilities, as shown in fig. 2.

The analysis of the *tuleros*' production process highlighted the environmental sustainability of this craft activity.

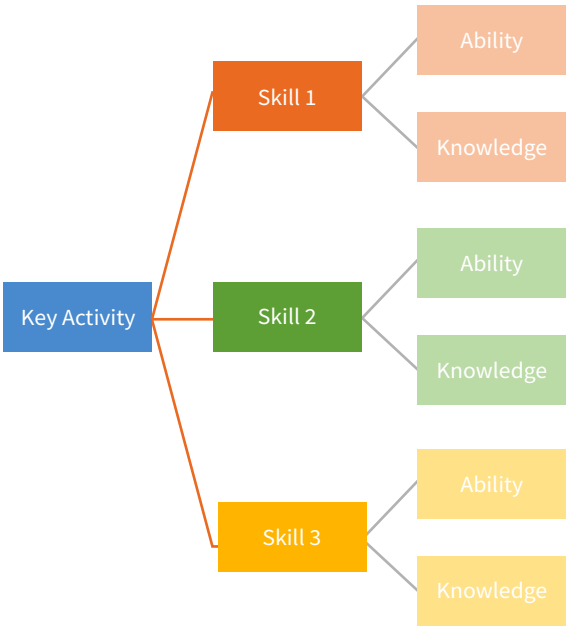

Figure 2. Framework for analysis of competencies in terms of knowledge and skills needed to carry out a specific key activity

Sowing and care of *tul* also generate positive effects on the lake ecosystem safeguard and the protection of animal and plant species that here live and reproduce. In addition, the daily use of products made of *tul* has a zero environmental impact, since they are fully biodegradable.

Thus, the significance of the system of knowledge and skills expressed by this production has a strong sustainability gradient. It is to be able to interrelate natural, social and economic systems, to connect the past, the present and the future generations, to promote the transformation of

unsustainable practices inspiring creativity and innovation through alternative views and positive relationships with the nature (UNECE 2012).

The values embodied by this TK can be shared and socialized through educational activities. In these terms, we can talk about measures for sustainable development, understood as a continuous learning process, through which humanity finds new ways to live with the planet and among different cultures and social classes (Mayer, Tamburini 2014).

The elements briefly described here show how these traditional indigenous workers are guardians of the local biodiversity and the CH, *carriers of highly relevant knowledge* on lacustrine habitat of the Atitlán Lake and of instruments that are indicated to defend such ecology.

Starting from these considerations, an educational activity to valorise this TK took place, aiming to create favourable conditions for sustainable management of local natural resources.

The training course was a start-up activity realized by the Environment Committee of the Municipality of Santiago Atitlán and involved 15 people.[9]

The educational objective of the course was to provide the cognitive tools to re-organize environmental practices, in terms of mental backgrounds, attitudes, ability to problem solving. It can be defined as a second-level learning that according to the definition by Gregory Bateson introduces a reflexive aspect about the context in which activity takes place (1973, 220, 271). In this case, some productive know-how of *tuleros* has been transferred to environmental management.

The educational strategy adopted is the *reflection on experience*: the environmental practices become material to systematize by verbal instruction. The intent was to create a space for reflection on the correlation between human actions and environmental consequences in order to achieve what John Dewey defines a way of thinking that is orderly and consequentially embedded in the action, controlled and guided by a purpose, targeted toward a conclusion and that goes in the direction of the investigation, accompanying it in its making (1961).

Following these indications, the training activity was divided into the steps shown in the table below (Bonaiuti, Calvani, Ranieri 2016).

9 Some municipal councillors in charge, members of different indigenous associations like *tuleros*, fishermen, *campesinos*, citizens of Panabaj, woodcutters, citizen in defence the municipal beaches and other civil society organizations that deal with environmental issues.

Table 2. Steps of training activity with member of local associations and municipal councillors.

Phases of the training process	Teaching activity	Teaching methods	Human resources employed
Identification and analysis of the problem	Participatory analysis of the municipal system of environmental management and of problems that affect their traditional productive activities.	Discussion Group Brainstorming Lectures by experts	Learning facilitator Experts in environmental management of the Ministry and other Institutions and Organizations that deal with environment
Formulation of an applicative or interpretive hypothesis	Defining a strategy for the sustainable management of natural resources starting from the ecological knowledge of traditional producers	Problem solving Working group	Learning facilitator
Verification of the hypothesis	Analysis of the consistency of the hypothesis identified with respect to the regulatory and organizational system of municipal environmental management	Lectures by experts	Experts in law from the Municipality Learning facilitator
Evaluation of the process	Systematization and participatory validation of the work performed for submission to "Consejo Municipal de Desarrollo". To evaluate formative outcomes of participants	Working group Discussion Group	Learning facilitator

In parallel to the unfolding of the training activity, we have held meetings with all members of the participating organizations in order to share the process under way and the results achieved.

The "Municipal Regulation of Environmental Management of Atitlán Lake's Banks" is one of the major achievements of this intervention-research. Product of the training, its purpose is to issue a set of rules and norms that contribute to safeguard natural resources as well as respect the traditional Mayan productive activities, also with positive effects on life conditions of producers and the whole community. Its core principle is the

reaffirmation of ecological and sustainable relationship between humans and nature through the non-separability of protection activities of natural resources from traditional production.

As evidenced by the analysis of the *tul* production process, some traditional activities are characterized by being closely related to the natural cycles, making the Mayan artisans experts on environmental issues and profound connoisseurs of their ecosystem. Their actions are aimed at the protection of resources, since they are the subject of their economic activities.

Sustainable governance of natural resources (Worldwatch Institute 2014) thus comes from combining environmental protection and the safeguarding of TK (and CH), through the recognition of the organisational forms linked to these productions. This makes it possible to legitimize the knowledge of the producers for the protection of the subject of their economic activity resources (*tul*, fauna of the lake, beaches, lake water, forest, arable land, etc.). The public authorities should therefore defend and promote these traditional works, since they retain natural and cultural diversity and at the same time represent economic income and, therefore, an opportunity for a more dignified life for those who dedicate to these activities.

5 Conclusions

Tul production can be rightfully considered as an ICH of the Guatemalan Mayan communities (2003 UNESCO Convention). Contributing to the maintenance of the lake's ecosystem through taking care of these plantations, *tul* production cycle represents, in fact, the indissolubility of the human/nature relationship, as described in the *Mayan cosmosvision*. According to the latter, human beings are integral part of natural environment and own responsibility to care for it, based on the idea of coevolution and co-determination. In this framework of sense, the importance of the nature goes beyond the specific objective of having properties, taking on a deep value that is inherent in the elements and events related to it.

The analysis of the skills involved in the *tul* production highlighted the sustainable character of knowledge of these Mayan artisans, following used: to define sustainable strategies for environmental management; to improve in a sustainable way the environmental practices of other local players thanks to an activity of Adult Education.

The research shows how the educational valorisation of ICH can promote the enforceability of the traditional know-how outside the specific production contests for:

- Sustainable management of natural resources trough participation approach;
- Transmission of sustainable knowledge, also in an intergenerational manner;

– Recognition of the role of Mayan producers in defence of the lacustrine ecosystems and safeguarding of TK.

In other words, the educational action renews the function of Tuleros Association as a HC, representing a mean of *participation in cultural and political life*, underlying the individual and collective responsibility towards CH, and a path toward conservation and sustainable use of cultural and natural assets to promote human development and quality of life.[10] From the action-research, it emerges that education is capable to reassert and improve the role of CH in building a peaceful and democratic society, in the processes of sustainable development and in the promotion of cultural diversity. For this, also a greater synergy between public, institutional and civil society players is urgently needed.

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10 This sounds as a concrete example of the principles and developments promoted by the Faro Convention.

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